

SHELLFISH AND BENTHOS COMMITTEE

by H. J. Thomas

1973

MOLLUSCA AND BENTHOS

Canada

(J. F. Caddy)

Ostrea edulis

Transplanted oysters overwintered on bottom in St Mary and Conception Bays, Newfoundland, suffered mortalities of 30-41%.

Crassostrea virginica

Transplantation of 'susceptible' oysters from Bras d'Or Lake to Malpeque Bay confirmed that high mortalities of this stock due to Malpeque disease still occur compared with local 'resistant' controls. An assessment of the feasibility of rearing oysters in an artificial pool continues. Spatfall and hydrobiological factors in the pool are being monitored.

Mytilus edulis

Successful trials of suspended culture from rafts begun by the Nova Scotia Dept of Fisheries in 1970, yielded 3 000 lb (1 360 kg) mussels per 21 m<sup>2</sup> raft at a size of 50-75 mm (10-20% meat yield) after 30 months' growth. Shells were fragile with no pearl incidence in the meats.

Optimal growth in warmed Bay of Fundy waters occurs at 15-20°C and 20‰ salinity. A comparative study of growth and metabolism from Newfoundland to the Carolinas is in process.

A study of hanging culture in relation to particle size and concentration is under way. Highest growth occurred in a eutrophic bay (Bedford Basin) receiving considerable amounts of domestic sewage. Animals reached marketable size in two seasons.

Placopecten magellanicus

Computer models were developed for the two major east coast fisheries incorporating spatial and temporal variations in recruitment and harvesting intensity. A nine-year cycle of recruitment in the Bay of Fundy was demonstrated by analysis of 50 years of catch data; it was probably caused by long-term environmental fluctuations. The closure of winter fishing within 7 miles of the NW Nova Scotia shore was reimposed in 1973 in an attempt to halt a long-term decline in catches.

'Clumping' of recruitment on the Northern Edge of Georges Bank and concentration of effort on to patches of 3-ring recruits led to imposition of a regulated upper limit (60 adductor muscles (meats) per lb = 132 per kg) on average meat sizes landed by the offshore fleet in 1973. A ban on vessel entry to both of these fisheries was introduced in 1973.

Chlamys islandicus

Studies on distribution and population dynamics of Iceland scallops in the north-east Gulf began in 1973. Landings fell slightly to 444 000 lb scallop meats, largely because of diversion of effort to other fisheries.

Mya arenaria

Multiple rings are laid down each year by this species and Mytilus edulis in the Bay of Fundy.

Oil pollution of clam flats causes abnormal behaviour, increases mortality, and affects caloric content.

Feasibility studies on depuration plants are under way, and are being preceded by clam resource inventory within areas closed owing to sewage pollution. An inexpensive hand-pushed hydraulic harvester has been developed which increases production 4 to 10 fold per tide, and is less damaging to harvested clams than traditional clam hacks, which break 25-50% of dug clams, making them unsuitable for depuration.

Ilex illecebrosus

A co-operative otter trawl survey by the Institut Scientifique et Technique des Pêches Maritimes (St. Pierre) and the Newfoundland Biological Station in May, made no significant catches on the continental shelf in water colder than 5°C. Best catches were on Georges, Browns and Western Banks in 88-273m.

Benthos

Strongylocentrotus droebachiensis. Resource potential and methods of fishing, holding and shipping live urchins are being investigated.

Long-term studies on benthic production in St Margaret's Bay, N.S. and the Saint John River Estuary, N.B. continue this year. It is planned to compare designs of sediment traps designed to measure vertical and horizontal movements of organic material over bottom sediments in St Margaret's Bay.

A study of effects of scallop dragging on lobster bottom is expected to continue.

A comparative study of associated fauna of natural and artificial lobster reefs is contemplated.

A towed continuous-lift hydraulic sampler, with air-lift assist, is under development for use to depths in excess of 30m: firstly as a benthic sampler, but with potential for commercial harvesting of clams, Irish moss, etc.

Federal Republic of Germany

(K. Tiews)

Crassostrea gigas

Raft culture experiments with Crassostrea gigas were continued in the Wadden Sea off the Isle of Sylt and in the western Baltic at the Institut für Küsten- und Binnenfischerei.

These studies will be continued in 1974.

### Mytilus edulis

Routine investigations on the growth and quality of wild and cultured mussels and on their infection rate with Mytilicola intestinalis, Modiolicola insignis and cercaria were continued at the Institut für Küsten- und Binnenfischerei. Experiments on the raft culture of mussels were continued in the western Baltic (Flensburger Förde) at the same Institut.

These studies will be continued in 1974.

### Cerastoderma edule (Cockle)

Cockle beds along the coast of Niedersachsen and Schleswig-Holstein were again surveyed by the Institut für Küsten- und Binnenfischerei. A small commercial fishery was started.

Survey work on the size of cockle populations along the German North Sea coast will be continued in 1974.

### Benthos

The Biological Station Helgoland continued its sampling of benthic communities, at special stations in the North Sea, to study changes in species distribution and the dynamic aspects of the eco-system.

The Institut für Meeresforschung at Bremerhaven continued its study on the distribution of microbenthos in the southern North Sea with special emphasis on nematodes, fungi and bacteria.

Studies on the development of benthos communities were continued in a brackish water pound at the Institut für Küsten- und Binnenfischerei.

The Institut für Meereskunde continued its studies on the availability of benthic food organisms in relation to the utilisation by fish in the Kiel Bight.

These studies will be continued in 1974.

### Finland

(J. Lassig)

### Benthos

At the Institute of Marine Research the quantitative studies on the bottom fauna in the sea area around Finland were continued at standard stations in June, July and November. A number of reference stations were visited in other parts of the Baltic. In co-operation with Tvärminne Zoological Station, studies on benthic macrofauna were continued in August in the archipelago of Tvärminne.

At the Tvärminne Zoological Station of the University of Helsinki the macrofauna was studied in the harbour of an iron mill in the vicinity of the research station.

At the Archipelago Research Institute of the University of Turku studies on the effects of organic pollution on soft-bottom macrobenthos off Turku were continued.

At the University of Oulu studies on benthic macrofauna were carried out within the frame of an investigation on the biota of the Bay of Liminka.

At the Water Conservation Laboratory of Helsinki City a survey on macrofauna was carried out at about 60 stations in the coastal waters off Helsinki.

France

(L. Marteil)

Huître

Favorisées par les conditions climatiques, les fixations des huîtres O. edulis et C. gigas ont été particulièrement abondantes en 1973. Elles rendront inutiles en 1974 l'importation de quantités massives de naissains étrangers comme cela avait été nécessaire les années précédentes.

La croissance des deux espèces a été satisfaisante. Le taux de mortalité chez C. gigas reste toujours faible.

La pathologie des huîtres plates et portugaises a donné lieu à de nouveaux travaux. L'épizootie qui frappe depuis quelques années O. edulis s'est étendue à de nouveaux secteurs à la fin de l'année 1973; des mesures prophylactiques ont été prises.

Mytilus edulis

Les prospections effectuées sur les gisements naturels et les parcs ont montré une reprise du parasitisme par Mytilicola intestinalis.

Pecten maximus

En dehors de l'étude annuelle des divers stocks de coquille St Jacques, il y a lieu de mentionner l'essai de captage de P. maximus tentée avec un certain succès par un biologiste du C.O.B.

Loligo forbesi

Du 14 avril au 4 mai 1973, le n/o "Thalassa" a effectué sur le banc de Rockall une campagne de recherche sur l'encornet. Les essais de pêche au chalut pélagique ont été infructueux mais un échantillonnage systématique a été réalisé sur les captures faites au chalut à grande ouverture (région IV b, 2ème trimestre 73, 11 échantillons, 514 individus mesurés).

Les prospections effectuées par le laboratoire de St Pierre et Miquelon au large de la Nouvelle-Ecosse et sur les accores des Grands bancs de Terre-Neuve, bien qu'effectuées à une époque peu propice, ont montré la possibilité d'envisager l'exploitation des stocks d'encornets de l'Atlantique nord-ouest.

Iceland

(H. Eiríksson)

Mytilus edulis

In 1973 experimental mussel rope culture was initiated at two locations in South-west and West Iceland. These experiments will be continued in 1974.

Chlamys islandica

Exploratory scallop surveys were carried out off the west and north-west coasts of Iceland, where new grounds were located in the Breiðafjörður area. Sampling was continued on similar lines as previously.



Tagging of Iceland scallops was initiated. In all, some 5 800 individuals were tagged. Recaptures of tagged scallops so far have been few with the exception of one area where approximately 9% were recaptured within two months of being tagged.

A catch quota of 4 500 tons was operative in the Breiðafjörður area and on the whole total catch was down on the previous year due to a large extent to unfavourable market prices and consequent lesser effort.

In 1974 a number of scallops surveys are planned in which tagging will figure prominently.

#### Arctica islandica

Surveys will be started in 1974 with a potential fishery for this species in mind.

#### Ireland

(F. A. Gibson)

#### Ostrea edulis

The spatfall in Tralee Bay, Co Kerry, oyster bed was monitored. A heavy settlement occurred from late June to early July, at a maximum water temperature of 18°C. The temperatures then dropped to 16-17°C, and a light spatfall continued until the end of August. Growth of the spat was moderate, the larger individuals ranging from 8 to 15 mm at the end of August. Spat collectors placed in deep water (10m) on the seaward side of the main oyster bed failed to catch any spat.

Having now determined the main spat settling areas of Tralee Bay, and eliminated the least productive areas, it is proposed to carry out full scale commercial collection of spat from 1974 onwards.

#### Mytilus edulis

Determination of diversity and quantity of primary production of food material was studied in certain south coast bays during 1973, with a view to establishing the suitability of these areas for sustaining cultured mussels. Concurrently records of temperature and salinity were kept for the areas examined. Preliminary results indicate a high degree of food production in most of the areas studied which would enable them to sustain much larger mussel populations than are indigenous to them at present. Most of the areas surveyed showed no evidence of good natural mussel settlement. Observations in these areas of current movements suggest that larvae are likely to be carried away from the better growing ground. Thus the potential of mussel production can only be realised by the introduction of simple farming techniques.

#### Pecten maximus

During the second half of May 1973 investigations were carried out concerned with the distribution of P. maximus on the western side of the Irish Sea. In dredging by the research vessel over a period of 7 full fishing days a number of scallop bearing grounds were located. The results were encouraging and concentrations of scallops were found near Lambey Island

(off the Dublin coast) and the Imogene Buoy in Dundalk Bay. The area around the Imogene Buoy, in which dredging yielded as many as 128 scallops per hour, seemed to be the most promising. This stock was found to be composed of a large number of age-groups and at the same time the quality of the meat and its yield per scallop was high. The Lambay stock, though containing large numbers of large scallops, lacked a wide distribution of age-groups and is therefore more vulnerable to the effects of fishing. This area may not be settled by juveniles every year.

It is hoped that in 1974, preliminary attempts will be made to rear the queen scallop, Chlamys opercularis.

In the Carna laboratory (connected with University College Galway) a number of lines of research were carried out. On-growing of C. gigas was studied. Native clams notably Venerupis decussa were used for hatchery, laboratory and on-growing experiments. The natural habitats of P. maximus, C. opercularis and C. varia were also studied.

### Netherlands

(P. Korringa)

#### Ostrea edulis

Though the stock of oysters born in the Oosterschelde steadily increased the Zeeland oyster farmers imported a fair quantity of oysters from Brittany for relaying to produce the quantities of marketable oysters they needed. The disease among flat oysters in north-western Brittany made it necessary to instruct the importers to limit their purchases to the unaffected areas. No mortality or disease was observed in the oysters on the beds of the Oosterschelde. The exceptionally fine summer of 1973 led both to an excellent spatfall on the mussel shells scattered on the beds and to very satisfactory growth and fattening. All oysters produced were marketed with low mortalities.

#### Mytilus edulis

Studies on laboratory and technical scale concerning cleansing and storage of marketable mussels were continued at the Mussel Experimental Station on the Isle of Texel. Understanding of the factors playing a part in these processes was considerably extended. Large quantities of mussels passed through the installations of the Experimental Station and found their way to markets abroad. These were followed closely, to obtain detailed information on their behaviour during transportation.

The results of investigations so far could be used to frame plans for the construction of a huge purification plant through which all mussels produced in the Netherlands could pass on their way to the market should the Oosterschelde be cut off from the sea, so making cleansing and storage in the vicinity of Yerseke impossible. These plans have been studied at different levels. Difficulties are not primarily technical but rather financial and social.

A series of experiments to cleanse mussels in a special ship, reconstructed for the purpose were started towards the end of the year. It proved possible to free mussels from all sand and silt contained between their valves after fishing. Such mussels could be used for the mussel canneries.

It is not yet clear whether such cleansing ships can also serve to produce mussels strong enough to transport them alive to the markets abroad. The experiments will be continued.

For a second year in succession growth and fattening of mussels was exceptionally good but marketing did not run as smoothly as expected. The high meat-content made some buyers decide to buy smaller consignments than they would have needed when the mussels had been leaner. Further, the rumours in the press about the possible role of mussels in the cholera outbreak in Naples made the public for some weeks reluctant to buy mussels. In the last week of the year an accident made it necessary to stop shipping mussels to the market: some mineral oil, spilled in a collision on the Oosterschelde, was dispersed by strong winds and transported with the tide to the mussels located on the cleansing plots near Yerseke. The mussels became strongly tainted so that their sale was interrupted whilst consignments were brought to clean plots. The affected mussels required about two months to get rid of their oily taste.

#### Cerastoderma edule

Cockle beds in the Zeeland estuaries, especially in the Oosterschelde, were heavily exploited in the year 1973. Formerly, cockles were only fished on intertidal grounds, especially on the tidal flats in the Waddenzee. Introduction of hydraulic dredging made it possible to exploit beds in deeper water. Large quantities of cockles were fished, steamed and shucked mechanically, and exported as deep-frozen product. Buyers were especially the shellfish canneries in north-western Spain. Exploitation is so heavy that the advisability of introducing conservation measures must be considered.

#### Norway

(K. R. Gundersen, B. Bøhle)

#### Mytilus edulis

Experiments in the laboratory showed that growth of juvenile mussels was highly dependent on both temperature and nutritional conditions (algal concentration). However, at very low algal supply, the growth was almost independent of the temperature. In nutrient sea water, the temperature optimum for length and weight increase seemed to be 16-18°C.

By means of netbags mussel spat from a locality near Bergen were transplanted to localities in Northern Norway, the South-Eastern Coast and the West Coast. The transplantations were successful and a comparison of the growth at the localities will be performed during 1974.

Experiments in 1973 with growth of mussels on netbags were extended to Northern Norway.

#### Chlamys islandica

During a survey and experimental fishery in August, a number of new beds were located off the west and north coasts of West Spitsbergen. Fishing was carried out with a triple Shetland scallop dredge, yielding up to 2 000 scallops per 20 minutes' haul. Some of the beds are estimated to be as rich as those found previously east of Bear Island. If the scallops can be processed in a rational way, profitable fishing may be carried out in both areas, but renewal of the beds is supposed to take place at a slow rate because of low temperature and irregular spawning.

### Cephalopods

No immigration of Todarodes sagittatus took place to the coast of Norway in 1973.

### Poland

Nothing to report.

### Portugal

(J. E. E. Cabido de Ataíde, M. J. Figueiredo)

### Crassostrea angulata

The mortality that affected the Portuguese oysters in February 1973, was followed both on the south coast of Portugal and in the Estuary of the River Sado. This heavy mortality in some places was as high as 50%, but practically stopped by the ensuing July. There was no evidence of a relationship between the mortality and the gill disease. The digestive gland, however, seemed to be affected. In spite of the mortality the spatfall was extremely good in 1973. More detailed studies are planned for 1974.

Attempts were made to improve the quality of the Portuguese oysters by transplanting young individuals, within the River Sado Estuary, from areas of high production to areas that showed best conditions for their growth. The increase in quality after a period of a year was noticeable, particularly in regard to fattening and copper contamination.

### Tapes decussatus

Routine investigations on the populations of this species in the wild, showed a decreasing recruitment of the young individuals.

### Spain

(H. H. Quiroga Lorenzo)

### Ostrea edulis

The reproduction, larval settlement and growth of the flat oyster was studied at different points on the north-west of Spain. The spat obtained were few, because of the low number of adult oysters.

Two year old flat oysters imported from France were studied as to their growth and condition index. Oysters imported in May with a mean size of 51 mm attained 72 mm by October.

### Crassostrea angulata

A plastic collector was used in the Guadalquivir Estuary. It was found that this collector has advantages over the tile collector because of its lightness and ease of handling. Recovery from the collector was 100%.



Mytilus edulis

Biometric and sexual development of mussels was studied in samples obtained at different points of the coast.

Littorina littorea

Observations on the growth and reproduction of this specie was begun on samples obtained from the commercial imports from France.

Benthos

Work was done on the growth, regeneration and other aspects of the red seaweed Gelidium sesquipedale biology and the test of artificial material to obtain settling was investigated.

Sweden

(B. I. Dybern)

Benthos

Investigations of mainly soft-bottom macrobenthos at the diagnostic stations in the Baltic and on the west coast were continued. Several investigations on soft-bottom macrofauna were also carried out at local sites for industries nuclear power plants and refineries.

United Kingdom

(P. R. Walne - England and Wales  
H. J. Thomas - Scotland)

Ostrea edulis

Surveys of spatfalls and stock levels in the main English oyster fisheries have been continued. Production from the two main natural stocks in the Solent and the Fal estuary (Cornwall) has continued to be good. In addition some oyster grounds in other areas which have not been worked for many years are being restocked and brought back into cultivation.

Crassostrea gigas

Methods for handling and growing the smallest sizes of hatchery-produced seed oysters (6-30 mg) were examined in 1973. This study, at the English laboratories, assessed the practical and economic aspects of growing small seed in trays on rafts to a size suitable for relaying on the sea bed.

Shellfish pests and diseases

The distribution of the oyster pests Crepidula fornicata and Urosalpinx cinerea have been monitored. No new records have been found for Crepidula but Urosalpinx has extended its distribution in Kent (SE England). The brine-dip treatment developed to kill Crepidula attached to oysters has been used successfully to treat oysters moved from areas infected with Crepidula to clean areas.

### Cerastoderma edule

Routine stock surveys have been carried out in the main fisheries in the Wash, Thames estuary and South Wales. In the Wash special emphasis has been given to the possible effects of a proposed water storage scheme using large intertidal reservoirs. In the Thames a similar study has been made of the likely effects of building London's third airport on the Maplin sands.

Topographical changes occurring in the Burry Inlet (S. Wales) are being mapped since several cockle beds have been destroyed following movements of the main river channel. The spread of the marsh-grass Spartina and the populations of predating oystercatchers are also being monitored in the area.

### Pecten maximus and Chlamys opercularis

The data obtained from tagged Pecten released in the Devon (West Channel) fishery have given estimates of growth and migrations.

Catch effort and composition data were obtained from the commercially exploited stocks in the Clyde, the south-west and north-west coasts and around Shetland. Population studies are being pursued. Scallop dredge selection experiments were undertaken by a research vessel. Further experiments were undertaken on the growth of settled spat.

Important fisheries for Chlamys have developed in recent years and stocks in the Channel and the Irish Sea have been monitored. A special study is being made of the population off Plymouth, in the English Channel. All age groups have been found, including large numbers of spat attached to hydroids.

Catch effort and composition data were obtained from stocks commercially exploited by the Scottish fishery and a comparison made of the catches by dredge and light trawl. Further assessments were undertaken of the abundance of pre-recruits.

### Mytilus edulis

The experiments on the exploitation of the seed stocks in Morecambe Bay are concentrating on the behaviour of plots laid on the coast of Anglesey. The results are demonstrating that Carcinus is the major problem.

Further observations have been made on the settlement and growth of mussels cultivated on ropes in several Scottish sea lochs.

### Loligo forbesii

Data were obtained from commercial landings in Scotland on catch effort and the seasonal variation in size, sex composition and maturity.

### Cardium edule

A further study was made of the cockle transplanting experiment undertaken at Barra.

### Bivalve culture

An experiment was initiated with settled spat to compare the rates of growth of Pecten maximus, Chlamys opercularis, Ostrea edulis and Crassostrea gigas in five different areas around Scotland.

### Benthos

An immigrant seaweed, Sargassum muticum, has become established on the Isle of Wight and in Portsmouth Harbour. Attempts are being made to control and eradicate the weed by hand-gathering.

During 1973 study of the ecology of a flatfish nursery ground in a Scottish sea loch (Loch Ewe) was continued, with emphasis on the larger epifauna and on organisms too sparse and too widely dispersed to be adequately sampled by grabs. For these animals, population estimates were made by divers operating on an underwater sledge. Underwater television mounted to scan a small section of the bottom was also used to study the behaviour of selected organisms.

Benthos studies were also carried out in the Clyde, where on a larger flatfish nursery ground in Irvine Bay (Ayrshire) estimates of fish food densities were made in both intertidal and subtidal grounds.

### U.S.S.R.

(B. Ivanov)

### Cephalopods

Investigations on the distribution of the epipelagic squid Ommastrephes pteropus were conducted in the open area of the Gulf of Guinea by the specialists of the Atlantic Research Institute of Marine Fisheries and Oceanography. The reaction of squids to light was studied. Ninety-four light stations were worked.

In 1974 Atlant NIRO will continue the investigations on the occurrence of squid off the coast of West Africa.

### Benthos

Investigations on distribution and the stock of the agar alga Furcellaria fastigiata were made near the Latvia shores (All-Union Research Institute of Marine Fisheries and Oceanography (VNIRO)). Furcellaria growths were found at depths of 7-15 m. The biomass of Furcellaria may be expressed as 600 g/m<sup>2</sup>. The standing crop was assessed to be about 65 thousand tons (wet weight). The growing process for Furcellaria was observed in tanks and in natural conditions in the Gulf of Riga during April, June and October by VNIRO specialists. According to preliminary data, the weight increment is about 900 g/kg per month, i.e. the plant weight increases almost twice per year.

The species composition and the distribution of algae in the inshore waters of Estonia were studied by the specialists of the Baltic Research Institute of Marine Fisheries (BaltNIIRH). Commercial stocks of Laminaria were studied by the Northern Department of PINRO near the Solovetsky Islands. Data on Laminaria distribution were collected with help of aqualung divers using a submarine glider. Laminaria was recorded at more than 9 000 stations. Laminaria, Fucaceae and Ahnfeltia plicata stocks were assessed. Algae stocks were greater than in the 1961 assessment but this may have resulted from improved methods of assessment.

Data on distribution of fucoids and on their stocks were collected. In the northern part of the Barents Sea investigations of inshore waters, approximately within the area from Pechora River estuary up to the Kanin

Peninsula, were continued by the specialists of the Northern Department of PINRO. Almost 750 km of inshore waters were surveyed. Sixty-one sections with 365 aqualung - stations up to 12m depth were worked and 61 quantitative samples of algae collected. Littoral and sublittoral algal vegetation of commercial value were poorly developed. The increase in the biomass of red agar algae (up to 1 kg/m<sup>2</sup>) was observed only in the western part of the area under investigations.

The specialists of VNIRO made studies on Fucus vesiculosus growth, biology and production along the Barents Sea shore near Murmansk. Observations on growth, both in natural conditions and in ponds, were also conducted. According to preliminary data the duration of F. vesiculosus life is equal to 4-6 years in that area the limits being 9-10 years. Of total sprouts only 14-20% reach their maturity. Annually, 45% of plants take part in the reproduction process. During the first year, growth makes 5-40 mm and during the second year about 20 mm. These investigations will be continued in 1974.

In 1974, BaltHIIRH plan to conduct investigations on algae in the near-estuary areas of rivers entering the Gulf of Riga. Further studies are planned of the species composition of algae, as well as of their stocks along the Latvia and the Lithuania shores. In 1974, VNIRO plan to study the growth and production of Furcellaria in the Baltic Sea, and to collect data on the biology of commercial fucoids of the Barents Sea. The Northern Department of PINRO will continue investigations of algae in some areas of the Barents Sea and study the condition of the algal stocks in the White Sea. A series of experiments on cultivation of valuable algae species is also planned.

#### U.S.A.

(R. L. Wigley)

#### Argopecten irradians

Field experiments were conducted in Chesapeake Bay to learn more about the movement patterns of this scallop. One thousand hatchery reared scallops averaging 20 millimetres in size were tagged with a yellow plastic disc. A reward is offered for information on the exact location and date of recapture.

Rhode Island opened a hatchery for reseeding and possible culture of this species.

#### Loligo pealei

A commercial fishing vessel was chartered to demonstrate the possible catch rates of long-finned squid off Southern New England. The vessel, a 100-foot stern trawler, fished with a high-opening trawl during January and February. Over 168 000 pounds of squid were caught at an average rate of 380 pounds per hour. This demonstration will permit representatives of the fishing industry to evaluate the potential of this resource.



## CRUSTACEA

### Belgium

(R. de Clerck)

#### Crangon crangon

The study of the population-dynamics of the shrimp-stock along the Belgian coast was continued. The final purpose of this study is the description and evaluation of the most important population-dynamic parameters for Crangon crangon in the existing mathematical models. During 1973 the research constituted monthly analyses of the shrimp-stock samples from 14 fixed stations, situated in three different fishing grounds and of qualitative and quantitative analyses of the epibenthic and benthic fauna in the by-catches of the experimental shrimp-fishery.

Similar studies will be continued in 1974. In addition, special attention will be given to the predators of the shrimps as well as to the commercial and the non-commercial species.

### Canada

(J. F. Caddy)

#### Homarus americanus

Canadian inshore landings have shown an unexplained decline from 1960 to 1972, particularly in the Northumberland Strait, but picked up slightly in 1973.

In the offshore fishery, which originated as a method of employing displaced swordfish fishermen, landings in 1973 were 1 million lb (454 000 kg). All available evidence suggests that this stock is separate from the inshore stock at least as adults.

In the work on endocrinology and lobster culture research concentrated on factors which reduce mortalities caused by premoult - inducing ecdysterone. It suggested that ecdysterone regulates cuticle formation only during premoult, and may even inhibit other premoult processes, thus causing mortalities on dosage. Bi-lateral eyestalk ablation induces precocious moulting of juveniles but inhibits limb regeneration. In its effects on reproduction the mandibular organ is not a Y-organ, but regulates reproductive processes in both sexes.

Hatching time is not under precise endogenous control as in H. gammarus: outer egg membranes rupture up to 2 hours before larval release, which occurs over a period of 4 weeks or more, usually at night. Vertical movements of larvae are more readily induced by changes in hydrostatic pressure than illumination. The shelter-seeking behaviour of post-larvae develops during stage IV.

Olfaction studies showed that the ethanol fraction contains the attractive compound (s) in fish muscle (bait). It seems likely that attraction by food or pheromone is dependent on two or more compounds.

In work on lobster processing it was found that intensive preliminary cooking inactivates hepato-pancreatic hydrolases, which cause declines in organoleptic ratings of tail meat in frozen whole lobsters.

A bibliography of crustacean diseases and an identification manual for Gaffkya homari were prepared and distributed to members of the committee by Dr J.E. Stewart.

The immunological competence and defence mechanisms of lobsters were tested by injected antigens. Vaccines prepared from virulent strains of G. homari do not induce a high level of protection, although a degree of immunity is mediated by phagocytic hemocytes. Virulence appears related to the extent of capsule formation by the bacterium.

In tank populations of healthy (undamaged) lobsters Anophrys sp. was again recorded in the winter of 1973.

Seven years after construction, the artificial reef off Richbucto N.B. can now be considered mature. It has a full range of lobster sizes and an annual productivity of lobsters estimated at 12 kg (equivalent to 40 + kg/hectare).

Chionoecetes opilio. Entanglement in groundfish gill nets accounts for mortalities to 1.9 out of 4.2 million lb (= 0.9 million out of 1.9 million kg) of incidental catches of commercial and subcommercial crabs (mostly males) off the south and east coasts of Newfoundland.

Fishing effort and landings of queen crab in the North-west Gulf increased in 1973. Centrifugal meat-shell separators are being used by some plants.

Cancer irroratus. Until recently Rock Crabs were considered a nuisance to inshore lobster fishermen in the Gulf of St Lawrence. Interest is now reviving with adoption of centrifugal meat separators by some plants and improved market acceptance of cooked whole crabs. Despite low meat yields (14%), a substantial fishery is now envisaged, initially within the lobster season. Most commercial sizes ( $3\frac{1}{2}$  in. + (= 8.9 cm)) are males.

Pandalus borealis. Despite severe spring ice conditions in the Northern Gulf, shrimp landings more than doubled to 484 MT in 1973. Research effort was largely concerned with size frequency analysis and elucidating year class distribution patterns.

#### Denmark

(Home waters S. Munch Petersen)

(Greenland waters E. Smidt)

#### Pandalus borealis

Echo-sounding and trawling experiments were carried out in inshore water in Umanak district (northern W. Greenland) in July, and in offshore water off Julianehaab (southern W. Greenland) in October. In both areas new resources for the fishery were found.

Research for new resources in both offshore and inshore waters may now be regarded as mainly finished. In future, collecting of catch and effort data from the commercial fishery will be the most important work.

In the North Sea mesh selection experiments were undertaken on P. borealis.

Chionoecetes opilio

Inshore trap fishing and tagging experiments were made in Godthaab district. They will be continued in 1974.

Federal Republic of Germany

(K. Tiews)

Crangon crangon

Investigations of the Institut für Küsten- und Binnenfischerei to assess the shares of undersized protected fish in the catch of the German shrimp fishery and the fluctuations in the abundance of fish species found on the shrimp fishing grounds were continued. A total of 330 samples (= 1 650 kg) of unsorted catch of the shrimp fishery were collected in Büsum, Cuxhaven, Neuharlingersiel, Dornumersiel, and analysed as to their species and length composition. Experimental work at the Institut für Küsten- und Binnenfischerei with Crangon crangon was continued to find out whether this shrimp changes its sex.

These studies will be continued in 1974.

Pandalus sp.

Samples of deep sea prawn catches made on the occasion of research cruises of RS "Friedrich Heincke" in Farn Deep area and on the Fladen Ground were analysed as to their species and length composition at the Institut für Küsten- und Binnenfischerei. A study on the stomach content of Pandalus was continued at the Institut für Hydrobiologie und Fischereiwissenschaft of the University of Hamburg.

Investigations on the composition of Pandalus catches in the North Sea and further food investigations will be continued in 1974.

France

(L. Marteil)

Nephrops norvegicus

Les sorties mensuelles ont été effectuées sur les vasières du sud-Bretagne et ont permis un échantillonnage des pêches commerciales. L'inventaire des apports des chalutiers artisanaux morbihannais travaillant dans le golfe de Gascogne, poursuivi toute l'année, permettra de suivre l'évolution des rendements aussi bien en langoustines qu'en jeunes merlus qui constituent la capture secondaire la plus importante notamment au printemps.

L'examen au laboratoire des pléopodes a permis de préciser diverses phases du cycle d'intermue.

### Homarus vulgaris

Le repeuplement en crustacés des zones côtières est de plus en plus assuré par l'immersion d'animaux produits en écloseries. Les quantités livrées annuellement par ces établissements augmentent régulièrement.

Les études poursuivies au laboratoire de l'Institut des Pêches à Roscoff ont démontré que des homards, nés et élevés en captivité, pouvaient se reproduire, permettant ainsi d'envisager une sélection des individus.

Des hybrides nés de l'accouplement d'un mâle américain et d'une femelle européenne ont pu être obtenus au laboratoire de Roscoff au début de 1973. Ils présentent avec l'espèce Homarus americanus des caractères morphologiques communs.

### Maia squinado

L'examen des contenus stomacaux révèle que ce crustacé est omnivore. Les déplacements de l'espèce ont été étudiés sur la côte nord de la Bretagne.

### Pathologie des crustacés

Les recherches sur Gaffkya homari ont été intensifiées et les possibilités d'infestation d'autres crustacés que homard étudiées. Les travaux ont également porté sur les maladies de Cancer pagurus et de Palaemon serratus.

### Iceland

(H. Eiríksson)

### Nephrops norvegicus

Routine collecting of data regarding Norway lobster landings, catch effort and catch composition were continued.

Two research vessel surveys were carried out which included the tagging of 2 920 animals and some selection experiments. Recaptures of tagged Nephrops remain to be low, around 1% or less.

During 1974 research will continue along similar lines with probably added concentration on mesh selection and collection of data on Nephrops larvae.

### Pandalus borealis

Several exploratory surveys were carried out in which commercial quantities of prawns were located in three new areas.

Fishing in deep water off the north coast has not been fully successful mainly due to bad weather and difficult bottom conditions.

An experiment on sorting undersized shrimps alive from the catch was carried out. For this purpose two types of Icelandic sorting machines were used. The results were promising as 80 to 58% survived after lying on deck for 15 to 45 minutes respectively. The fishermen were, however, more interested in using mesh selection. After several experiments with different mesh sizes it was therefore decided to increase the mesh size from 32 mm to 36 mm.



Research was carried out in the same manner as in former years, on samples and catch and effort data were collected.

In 1974 research on Pandalus will be carried out along the same lines as in 1973. In addition, collecting of pandalid larvae is planned.

#### Ireland

(F. A. Gibson)

##### Homarus gammarus

Routine analyses of lobster catches were continued in 1973 when approximately 4 500 individuals were examined. The census of the lobster fishery was continued. As this work continues it becomes more refined and informative, now showing that the drop in the catch of lobsters per trap over the past five or six years has continued, even though there was a slight recovery in 1973. The catch per effort scheme of voluntary submission of data by fishermen was also continued in 1973, with the same limited success which characterised previous years. The scheme will be reorganised in 1974 and arising from this it is anticipated that there will be a considerable improvement in the flow of data. Catch plotted against catch per unit effort showed a decline, thus confirming the census data.

##### Palinurus sp.

Controlled laboratory experiments concerned mainly with the optimal conditions for live storage of Palinurus were undertaken in 1973. To date, 113 experiments have been carried out relating to the oxygen uptake by Palinurus and this work will continue over the next few years. Analysis of the role of ammonia during live storage will also be studied in 1974. Having regard to the importance to the trade of ecdysis, serum protein concentrations and ova deposition, so far as the animal's condition is concerned, these matters received priority investigation.

Studies of the biology, habitat and behaviour of the crawfish were continued, including observations made by skin-divers working in large underwater enclosures which contain selected populations.

The occurrence of P. mauritanicus in Irish waters was also studied. An intensive study of gonadal development, particularly in the female but also and to a lesser extent in the male, was completed in 1973. It is hoped that a suitable digestion of this research will be published in 1974 or early in 1975.

During 1974 the above work will be continued and an intensive study of tagging methods will be conducted under controlled conditions.

##### Cancer pagurus

Owing to the demands of crawfish research, further work with C. pagurus was suspended in 1973 and it may not be possible to continue this work in 1974.

##### Nephrops norvegicus

Routine sampling was continued during the year and included a study of sexual abnormalities in addition to other standard data collected. Furthermore, a programme of marking Nephrops by tail punching and returning them to their

own sea-bed area was carried out by skin-divers in July, in a shallow area where no trawling occurs. It is planned to attempt recovery of marked individuals, by using skin-divers, in July 1974. This experiment was accompanied by a small scale laboratory trial to see if tail-punching depressed the increment at moulting to any serious extent.

In 1974 experimental fishing will be undertaken for Palaemon serratus.

#### Italy

No report received.

#### Netherlands

(P. Korringa)

#### Crangon crangon

The Netherlands' investigations on the brown shrimp concentrated in 1973 on its biological cycle. Weekly sampling of the landings brought in from the fishing areas near the islands of Texel and Sylt (Danish coast) was carried out to obtain a year-round picture of the presence and of the stage of maturity of eggs carried by female shrimps. Data on the landings per fishing day from both these areas and on the mean body-length of female shrimps (strongly correlated with the number of eggs per female) formed the basis of a quantitative estimation of the strength of the different spawnings of shrimp larvae produced in the course of the year.

The results of the weekly sampling in the area of Texel were also used in studies on the autumn migration of the brown shrimp. In these migration studies shrimps were sampled and sexed on a number of cruises in Dutch coastal waters (Waddenzee, Oosterschelde, Westerschelde) especially in areas with a considerable depth range, from tidal flats to relatively deep channels. The total surface of the dorso-lateral shields of the first three segments of the abdomen were plotted against the square of the body-length of female shrimps carrying ripe (black), and unripe (yellow) eggs, or carrying no eggs at all, caught in the same fishing area with intervals of two weeks. The results of this work strongly suggest that the autumn migration is a strictly patterned process, in which shrimp categories in different stages of sexual maturity each have their own place. From the work carried out on the life-cycle of the brown shrimp in 1973 and in previous years it has become clear that individual shrimps must have their own "time-clock" mechanism on which their life cycles depend. Owing to the long period of reproduction (10 months per year) the life-cycles of individual shrimps born at different times of the year can differ considerably, but a strong synchronisation between the "time-clocks" creates strict order in the life-cycle of the species as a whole.

#### Norway

(K. R. Gundersen, B. Bøhle)

#### Homarus gammarus

The lobster investigations in the field were carried out mainly in the same way as in previous years.

Recaptured tagged lobsters from earlier tagging experiments were studied in respect of moulting increase in length and weight, and if in fine condition and the tag perfectly fixed, were liberated again in other areas.

### Cancer pagurus

Experiments with different types of crates, in order to study mortality during feeding of crabs, were carried out during winter and spring. At the same time mortality caused by different ways of disarming the claws were carried out.

In the Hjeltefjord area fishing experiments were carried out with bow-net to investigate migration of crabs to deeper water in wintertime. 90 tagged crabs were dropped on depths more than 200 m. Up to this date only one of these is recaptured in shallow waters.

The crab investigations in Trøndelag, started in 1972, continued mainly on the same scale as previously. In this area about 1 200 crabs were tagged and released.

### Pandalus borealis

The Institute has continued to work on a prawn sorting trawl which mainly catches prawns and allows fish to escape. Attempts to construct sorting net in the large Norwegian prawn trawls ("Sputnik" trawl) have been given up. Experiments with the sorting net principle have been more successful in the Canadian type of prawn trawl ("Kodiak" trawl) and in the old Norwegian prawn trawl ("Vingetrål").

The Institute has taken part in the exploration for new prawn fields. Good prawn concentrations have been found in the Svalbard area and in the north-east Barents Sea.

#### Poland

Nil report

#### Portugal

(J. E. E. Cabido de Ataíde, M. J. Figueiredo)

### Nephrops norvegicus

The programme of sampling N. norvegicus, captured by trawlers and by inshore boats, started in 1972 for the study of the length composition of the populations was continued.

### Palaemon serratus

Experiments were made on the larval feeding of P. serratus. The growth of this species, after post-larval stage, was followed during several months in recirculating sea water aquariums fitted with biological filters.

#### Spain

(H. H. Quiroga Lorenzo)

### Shrimp

Commercially exploited shrimps from the Canary Islands fishing grounds were studied, especially Plesionika edwardsii, Parapandalus narval and Heterocarpus ensifer. The data obtained will be published with the Canary Islands fishing chart.

Penaeus kerathurus

The reproduction of the prawn, Penaeus kerathurus, was studied in the laboratory especially in regard to phytoplankton and zooplankton culture, and larval nutrition on phytoplankton and zooplankton, larval survival and growth up to the adult stage and nutrition on several commercially manufactured foods.

Sweden

(B. I. Dybern)

Homarus gammarus

A small investigation was carried out on the time individual lobsters stay in their hollows. The studies were carried out in situ by divers during the close season. The results indicate that there is a rather rapid change of inhabitants in the holes.

Cancer pagurus

Earlier studies of the ecology and migration pattern were continued.

Pandalus borealis

Information on daily catches from 15-20 commercial trawlers was collected and efforts to make stock assessment for Skagerak populations were continued.

Nephrops norvegicus

Daily reports were obtained from about 40 trawlers on some fishing grounds. The compilation of several years' reports was started.

United Kingdom

(P. R. Walne - England and Wales  
H. J. Thomas - Scotland)

Homarus gammarus

The general survey of the lobster stocks around England and Wales was completed at the end of 1973. This preliminary study will be followed in the future by more detailed stock assessments in regions where conservation problems have been identified. The survey included the collection of carapace length measurements of the catch landed in all the important lobster ports. Observations were also made on spawning, egg-carrying, hatching and the size at maturity. Data on catch-per-unit of effort have also been collected. The various parameters collected during this survey are now being examined and the results and recommendations will be reported in 1974.

Population studies were continued in Scottish waters, data on landings, catch effort and catch composition being obtained for all the main areas of exploitation. Further observations were made on a lobster environment improvement experiment.

Further experiments were undertaken comparing the catching efficiency of parlour traps and Scottish creels.



Palinurus elephas

288 tagged crawfish were released during August off the coast of Cornwall. By the end of January 20 (6.9%) had been returned.

Cancer pagurus

Collection of catch and effort data and observations on the population structure of the main stocks off south-west England and along the east and north-east coast was continued. Further releases of suture-tagged crabs were made on the offshore grounds in the English Channel. A total of 4 476 crabs have now been released and several of those recaptured have moved more than 25 miles (40 km). With further recaptures it should be possible to establish stock relationships in the English Channel.

Routine sampling of the catch of crabs and collection of catch effort data from selected boats were continued in the main fishing areas off Scotland. Tagging experiments were undertaken at Shetland.

Crangon crangon

A study of the Morecambe Bay Crangon fishery, past and present, was begun. The Thames estuary stock was surveyed.

Observations on the Scottish Crangon fishery in the Solway were continued.

Pandalus borealis

The English Farn Deep survey (October 1973) included observations on P. borealis distribution and abundance.

Studies were undertaken from Scotland of the commercial fishery of Pandalus borealis on the Fladen and the Farn Deep grounds. Catch per unit effort and composition data were obtained and a study made of the by-catch.

Pandalus montagui

Biological investigations, gear and fishing methods and the history of the Wash fishery for P. montagui were summarised and published. The present high level of shrimp abundance in the Wash was reflected in excellent commercial landings during 1973.

Nephrops norvegicus

Routine examination of samples from the North Sea and Irish Sea were continued. Trials with experimental trawls, begun in 1972, continued to show promise in 1973. The annual stock survey of the Farn Deep (Northumberland) was completed in October 1973, and the biological results from Farn Deep surveys 1959-73 are under examination.

Population studies involving landings, catch effort and catch composition data in Scottish waters were continued.

U.S.S.R.

(B. Ivanov)

Shrimp

In 1974 Atlant NIRO will make further investigations of Pandalus borealis in the open areas of the Barents Sea and on the stocks of shrimps off the coast of West Africa.

In May-July 1973, the distribution of deep-sea shrimps Aristaeus varidens and Nematocarcinus africanus along the continental slope of Angola was investigated within the area from 5°30'S up to 12°S at depths of 300 m to 600 m by the specialists of the Atlantic Research Institute of Marine Fisheries and Oceanography (Atlant NIRO). In total, 40 hauls were made; about 4 thousand specimens of A. varidens and 6 000 specimens of N. africanus were examined. The spawning period was ascertained for both species, but, for A. varidens it was the peak of spawning, whereas for N. africanus it was only the beginning of the spawning period.

Pandalus borealis

During the period from July 27 to October 15 a study was made of the Pandalus borealis stock, its distribution and biology, in the western part of the Barents Sea by the specialists of the Polar Research Institute of Marine Fisheries and Oceanography (PINRO). In total, 432 hauls for Pandalus borealis were made. Sixty-nine analyses of the shrimp catches in field conditions and 12 in a laboratory (each sample being of 300 specimens) were undertaken. Also, 12 analyses of catches using a near-bottom net were made. Fifteen series, by submarine observations of the bottom, were made along the track of the trawl. A quantitative assessment of P. borealis was made on two occasions by hydrostate. Commercial concentrations of P. borealis were found in 5 areas and their possible stock in those areas was estimated. Successful tests were made with two codend shrimp trawls.

U.S.A.

(R. L. Wigley)

Homarus americanus

Field studies included the continuation of studies on biology and behaviour, also routine monitoring of commercial catch, effort, and size compositions, and an evaluation of the most appropriate methods of determining abundance. Good information on the first and last of these items was obtained during a 5-vessel study off Southern New England in June. Observations were made from the research submarine 'Nekton', samples were collected by trawling from a research vessel and by baited pots fished by commercial potting vessels, and photographs were taken of lobsters in situ by means of a special underwater camera system.

Laboratory work consisted of assembling the necessary data to undertake an assessment of population size and to construct a mathematical model that will attempt to measure the effects upon yield when any controllable parameters are changed.

Pandalus borealis

Some of the major population parameters such as: growth rate, mortality, recruitment, standing crop, and yield, were determined for the northern shrimp stock in the Gulf of Maine. Population estimates have revealed a declining abundance, and this is reflected in the landings per trip, which decreased from 3 000 lb (1 360 kg) in 1966 to 1 000 lb (450 kg) in 1973.

Mesh selection experiments were conducted and the results analysed. An interim agreement by Maine, New Hampshire, and Massachusetts was reached that will require shrimp fishermen to use a minimum codend mesh of  $1\frac{1}{2}$  in. (3.8 cm) stretched measure.

A gill disease of northern shrimp in the Gulf of Maine, called "Black Spot Gill Disease", was studied. It is widespread and common in the Gulf and infects both males and females. It results in damage to the gill lamellae. Causitive agent of this disease is unknown. There is some evidence that the incidence of this disease is directly correlated with shrimp abundance.

Geryon quinquedens

Routine sampling of deep sea red crabs caught by three vessels in the same area off Southern New England was conducted during the latter part of 1973. This species is caught by means of lobster pots fished at water depths of 175 to 450 fm (320 to 820 m). Catch-per-unit-effort and size-sex composition were the principal parameters monitored.

Distribution, with special emphasis on depth of occurrence, and size and sex composition in the vicinity of Norfolk Canyon (east of Virginia) was investigated.



SHELLFISH AND BENTHOS COMMITTEE

1973

Italy  
(F. Matta)

Mollusca and Benthos

Ostrea edulis and Crassostrea angulata

The work on the bio-ecology of these species in the Lagoon of Venice and Scardovari Cove in the Pô delta, was continued. Settlements of Crassostrea were remarkable in abundance and vitality. Surveys were undertaken to rationalise exploitation of the beds and investigations made on the settlement of larvae on various types of supports.

Crustacea

Penaeus kerathurus

Experiments on the rearing of Penaeus kerathurus under artificial conditions were continued.

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